

CLAIMS

1 1. An information recording medium that has a
2 nonvolatile memory and is read and written contactlessly
3 using radio waves, comprising:

4 storing means having storage areas;

5 holding means for holding area identifiers which
6 each identify a different one of the storage areas;

7 secret receiving means for receiving an access
8 identifier in secrecy from an external access device;

9 judging means for judging whether the received
10 access identifier matches one of the area identifiers in
11 the holding means;

12 access information receiving means for receiving
13 access information from the access device, when the access
14 identifier matches one of the area identifiers; and

15 accessing means for accessing a storage area that
16 is identified by the access identifier, based on the
17 received access information.

1 2. A contactless IC tag that has a nonvolatile memory
2 and is read and written contactlessly using radio waves,
3 the contactless IC tag being attached to an item which
4 passes through multiple stages of a life cycle from
5 manufacture to disposal, the contactless IC tag

6 comprising:

7 storing means having stage storage areas as many as
8 the stages of the life cycle;

9 identifier holding means for holding stage
10 identifiers that each identify a different one of the stage
11 storage areas;

12 secret receiving means for receiving an access
13 identifier in secrecy from an external access device;

14 judging means for judging whether the received
15 access identifier matches one of the stage identifiers
16 in the identifier holding means;

17 access information receiving means for receiving
18 access information from the access device, when the access
19 identifier matches one of the stage identifiers; and

20 accessing means for accessing a stage storage area
21 that is identified by the access identifier, based on the
22 received access information.

1 3. The contactless IC tag of Claim 2,

2 wherein the secret receiving means includes:

3 authenticator outputting means for generating a
4 first authenticator and outputting the first
5 authenticator to the access device;

6 acquiring means for acquiring a second authenticator
7 that is obtained by encrypting the first authenticator

8 by an encryption algorithm using the access identifier
9 as an encryption key, from the access device; and
10 encrypting means for encrypting the first
11 authenticator by the encryption algorithm using the stage
12 identifiers each as an encryption key, to generate third
13 authenticators,

14 the judging means judges whether the acquired second
15 authenticator matches one of the third authenticators,
16 and if the second authenticator matches one of the third
17 authenticators, judges that the access identifier matches
18 one of the stage identifiers, and

19 the accessing means accesses a stage storage area
20 identified by a stage identifier which is used as an
21 encryption key to generate the third authenticator that
22 matches the second authenticator, as the stage storage
23 area identified by the access identifier.

1 4. The contactless IC tag of Claim 3,
2 wherein the authenticator outputting means
3 generates the first authenticator randomly.

1 5. The contactless IC tag of Claim 4,
2 wherein the secret receiving means further includes:
3 channel selecting means for selecting one of a
4 plurality of communication channels obtained by time-

5 division multiplexing; and

6 identifier receiving means for receiving the access
7 identifier in secrecy, through the selected communication
8 channel.

1 6. The contactless IC tag of Claim 5,
2 wherein the channel selecting means selects the
3 communication channel randomly.

1 7. The contactless IC tag of Claim 2,
2 wherein the storing means has a common storage area
3 identified by a common identifier,
4 the identifier holding means stores the common
5 identifier,

6 the judging means judges whether the received access
7 identifier matches the common identifier in the
8 identifier holding means,

9 the access information receiving means receives the
10 access information from the access device, when the access
11 identifier matches the common identifier, and

12 the accessing means accesses the common storage area
13 identified by the access identifier, based on the received
14 access information.

1 8. The contactless IC tag of Claim 2,

2 wherein the nonvolatile memory is a fuse memory.

1 9. The contactless IC tag of Claim 2, being provided
2 near a logotype that is positioned on a surface of the
3 item.

1 10. The contactless IC tag of Claim 2, further
2 comprising
3 time information storing means for storing, when
4 data is stored into the storing means, time information
5 into the storing means together with the data.

1 11. The contactless IC tag of Claim 2,
2 wherein the storing means has a first memory unit
3 which is non-rewritable and a second memory unit which
4 is rewritable.

1 12. The contactless IC tag of Claim 2,
2 wherein the storing means has an extension storage
3 area for storing data which cannot be stored in the stage
4 storage areas due to insufficient free space.

1 13. The contactless IC tag of Claim 10, further
2 comprising
3 memory organizing means for deleting, when data

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4 cannot be stored into the storing means due to insufficient
5 free space, data whose time information is oldest from
6 the storing means, to increase the free space.

1 14. The contactless IC tag of Claim 2, further
2 comprising:

3 master identifier holding means for holding a master
4 identifier;

5 master identifier judging means for judging whether
6 the received access identifier matches the master
7 identifier in the master identifier holding means; and

8 master access information receiving means for
9 receiving master access information from the access
10 device, when the access identifier matches the master
11 identifier,

12 wherein the accessing means accesses one of the stage
13 storage areas based on the received master access
14 information.

1 15. A contactless IC tag that has a nonvolatile
2 memory and is read and written contactlessly using radio
3 waves, the contactless IC tag being attached to an
4 inpatient who passes through multiple stages of a hospital
5 cycle from admission to release, the contactless IC tag
6 comprising:

7 storing means having stage storage areas as many as
8 the stages of the hospital cycle;

9 identifier holding means for holding stage
10 identifiers that each identify a different one of the stage
11 storage areas;

12 secret receiving means for receiving an access
13 identifier in secrecy from an external access device;

14 judging means for judging whether the received
15 access identifier matches one of the stage identifiers
16 in the identifier holding means;

17 access information receiving means for receiving
18 access information from the access device, when the access
19 identifier matches one of the stage identifiers; and

20 accessing means for accessing a stage storage area
21 that is identified by the access identifier, based on the
22 received access information.

1 16. A contactless IC tag that has a nonvolatile
2 memory and is read and written contactlessly using radio
3 waves, the contactless IC tag being attached to a
4 brand-name product which passes through multiple stages
5 of a life cycle from manufacture to disposal, the
6 contactless IC tag comprising:

7 storing means having stage storage areas as many as
8 the stages of the life cycle;

9 identifier holding means for holding stage
10 identifiers that each identify a different one of the stage
11 storage areas;

12 secret receiving means for receiving an access
13 identifier in secrecy from an external access device;

14 judging means for judging whether the received
15 access identifier matches one of the stage identifiers
16 in the identifier holding means;

17 access information receiving means for receiving
18 access information from the access device, when the access
19 identifier matches one of the stage identifiers; and

20 accessing means for accessing a stage storage area
21 that is identified by the access identifier, based on the
22 received access information.

1 17. An access device for sending/receiving
2 information to/from an information recording medium that
3 has a nonvolatile memory and is read and written
4 contactlessly using radio waves, the information
5 recording medium having storage areas which are each
6 identified by a different secret identifier, the access
7 device comprising:

8 identifier storing means for storing an access
9 identifier;

10 secret sending means for sending the access

11 identifier in secrecy to the information recording
12 medium; and

13 access information sending means for sending access
14 information to the information recording medium, when the
15 information recording medium judges that the access
16 identifier properly identifies one of the storage areas.

1 18. An access device for sending/receiving
2 information to/from a contactless IC tag that has a
3 nonvolatile memory and is read and written contactlessly
4 using radio waves, the contactless IC tag being attached
5 to an item which passes through multiple stages of a life
6 cycle from manufacture to disposal and having stage
7 storage areas as many as the stages of the life cycle,
8 each stage storage area being identified by a different
9 secret identifier, the access device comprising:

10 identifier storing means for storing an access
11 identifier;

12 secret sending means for sending the access
13 identifier in secrecy to the contactless IC tag; and

14 access information sending means for sending access
15 information to the contactless IC tag, when the
16 contactless IC tag judges that the access identifier
17 properly identifies one of the stage storage areas.

1 19. The access device of Claim 18,
2 wherein the contactless IC tag stores stage
3 identifiers that each identify a different one of the stage
4 storage areas,
5 the secret sending means includes:
6 authenticator receiving means for receiving a first
7 authenticator from the contactless IC tag; and
8 authenticator outputting means for encrypting the
9 received first authenticator by an encryption algorithm
10 using the access identifier as an encryption key to
11 generate a second authenticator, and sending the second
12 authenticator to the contactless IC tag, and
13 the access information sending means sends the
14 access information to the contactless IC tag, when the
15 contactless IC tag (a) encrypts the first authenticator
16 by the encryption algorithm using the stage identifiers
17 each as an encryption key to generate third authenticators,
18 (b) judges whether the second authenticator matches one
19 of the third authenticators, and (c) if the second
20 authenticator matches one of the third authenticators,
21 judges that the access identifier properly identifies one
22 of the stage storage areas.

1 20. An access device for sending/receiving
2 information to/from a contactless IC tag that has a

3 nonvolatile memory and is read and written contactlessly
4 using radio waves, the contactless IC tag being attached
5 to an item which passes through multiple stages of a life
6 cycle from manufacture to disposal and having stage
7 storage areas as many as the stages of the life cycle,
8 each stage storage area being identified by a different
9 secret stage identifier, the access device comprising:
10 identifier accepting means for accepting an access
11 identifier;
12 secret sending means for sending the access
13 identifier in secrecy to the contactless IC tag; and
14 access information sending means for sending access
15 information to the contactless IC tag, when the
16 contactless IC tag judges that the access identifier
17 properly identifies one of the stage storage areas.

1 21. An access system comprising the information
2 recording medium of Claim 1 and the access device of Claim
3 17.

1 22. An access system comprising the contactless IC
2 tag of Claim 2 and the access device of Claim 18.

1 23. An access system comprising the contactless IC
2 tag of Claim 2 and the access device of Claim 18,

3 wherein access devices are provided in a one-to-
4 one correspondence with the stages, and each access device
5 accesses only a stage storage area in the contactless IC
6 tag that corresponds to a stage for which the access device
7 is provided, to manage the item.

1 24. An input/output method for use in a contactless
2 IC tag that has a nonvolatile memory and is read and written
3 contactlessly using radio waves, the contactless IC tag
4 being attached to an item which passes through multiple
5 stages of a life cycle from manufacture to disposal, and
6 including: storing means having stage storage areas as
7 many as the stages of the life cycle; and identifier
8 holding means for holding stage identifiers that each
9 identify a different one of the stage storage areas, the
10 input/output method comprising:

11 a secret receiving step for receiving an access
12 identifier in secrecy from an external access device;

13 a judging step for judging whether the received
14 access identifier matches one of the stage identifiers
15 in the identifier holding means;

16 an access information receiving step for receiving
17 access information from the access device, when the access
18 identifier matches one the stage identifiers; and

19 an accessing step for accessing a stage storage area

20 that is identified by the access identifier, based on the
21 received access information.

1 25. An access method for use in an access device for
2 sending/receiving information to/from a contactless IC
3 tag that has a nonvolatile memory and is read and written
4 contactlessly using radio waves, the access device
5 including identifier storing means for storing an access
6 identifier, the contactless IC tag being attached to an
7 item which passes through multiple stages of a life cycle
8 from manufacture to disposal and having stage storage
9 areas as many as the stages of the life cycle, each stage
10 storage area being identified by a different secret stage
11 identifier, the access method comprising:

12 a secret sending step for sending the access
13 identifier in secrecy to the contactless IC tag; and

14 an access information sending step for sending
15 access information to the contactless IC tag, when the
16 contactless IC tag judges that the access identifier
17 properly identifies one of the stage storage areas.